Short Answer:

Answer the following questions with complete sentences in your own words. You are encouraged to conduct your own research online or through other methods before answering the questions. If you research online, please consult multiple sources before you write down your answers. You are expected to be able to explain your answers in detail (Provide examples for each question).

1. What is LINQ and What's the advantage of using LINQ?
2. What are the different ways to write LINQ query syntax?
3. Explain what are LINQ providers and what is the purpose of LINQ providers in LINQ?
4. What are the basic steps of executing LINQ Query?
5. Why SELECT clause comes after FROM clause in LINQ?
6. What is the anonymous type?
7. What is Standard Query Operators?
8. What are immediate execution and deferred execution? Giving some examples for each
9. When to use First() and when to use FirstOrDefault() with LINQ?
10. What's the difference between IEnumerable and IQueryable?
11. What is a thread, and what is a process?
12. How to create a thread in C#?
13. Talk about the Thread Life cycle.
14. What is data interference? How can we avoid data interference?
15. What is a deadlock? How to avoid deadlock?

Coding Questions:

Write code in c# to solve the following problems. Please write your own answers. You are highly encouraged to present more than one way to answer the questions. Please follow best practices when you write the code so that it is easily readable, maintainable, and efficient. Clearly state your assumptions if you have any. You may discuss with others on the questions, but please write your own code.

*Please create the corresponding type

1. Given a list of int

```
int[] arr1 = new int[]{3,9,2,8,6,5, 3, 2, 2};
```

    a) Using LINQ, Find the number and its square of an array which is more than 20

       The output should look like this:

```
{ Number = 9, SqrNo = 81 }
{ Number = 8, SqrNo = 64 }
{ Number = 6, SqrNo = 36 }
{ Number = 5, SqrNo = 25 }
```

    b) Using LINQ, display the number and frequency of number from given array

       The output should look like this:

```
Number 2 appears 3 times

Number 3 appears 2 times
```

```
Number 9 appears 1 times

Number 8 appears 1 times

Number 6 appears 1 times

Number 5 appears 1 times
```

2. Given a string of words

```
Eg. string sentence = "the quick brown fox jumps over the lazy dog";
```

Using LINQ, Group the words by their length in ascending order and display them.

The output should look like this:

```
Words of length 3:    THE, FOX, THE, DOG

Words of length 4:    OVER, LAZY

Words of length 5:    QUICK, BROWN, JUMPS
```

*use both query syntax and method syntax to achieve that

3. Given a Car list

```
var c = new Car[]
{
new Car{ Color="Blue", Price=28000},
new Car{ Color="Red", Price=54000},
new Car{ Color="Pink", Price=9999},
new Car{ Color="Black", Price=46722},
new Car{ Color="White", Price=35264}
};
```

      a)   Find the index of the frst car whose Price is smaller than 10000 with LINQ?

      b)   Find the colors for the top 3 highest Car price

4. Generate your own list of students and teacher

```
class Student
{
public string First { get; set; }
public string Last {get; set;}
public int ID { get; set; }
public string Street { get; set; }
public string City { get; set; }
public List<int> Scores;
}

class Teacher

{
public string First { get; set; }
public string Last { get; set; }
public int ID { get; set; }
public string City { get; set; }
}
```

      a)   Using LINQ, display the student name and the teacher name who live in the same city

      b)   Using LINQ, generate a list of objects, each object contains the **student name** and the **teacher name** who live in the same city and the city name is "New York"

5. Research on Monitor class and how to use Monitor class to cope with Deadlock!